Amateur Satellite Report

Number 131
September 1, 1986

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AMSAT's Newsletter for the Amateur Radio Space Program

Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

Birth of a New OSCAR: First All Japanese Project Debuts

The Japanese Amateur Space Program has produced its first successful all-Japanese satellite with the flawless launch and initial operation of Japan OSCAR 12. The new satellite was known as JAS-1 prior to launch.

A joint project of the Japanese Amateur Radio League (JARL), Japan AMSAT (JAMSAT) and Nippon Electric Company (NEC), the newest OSCAR is the result of a half decade of planning and an estimated $2 million commitment from Japanese commercial interests.

The launch of the H1 rocket was thrice postponed but on August 12, all the factors were correct. The launch from southern Japan occurred at 20:45:00.5 on August 12, UTC. (August 13, Japan time.) The launcher performed flawlessly. The performance of the launcher was so precise that initial satellite tracking based on adjusted pre-launch, predicted values proved adequate for tracking for the first few days of JO-12's life.

Precisely at 21:47:07 UTC JO-12 was born. The beacon came on as expected over South America where it was immediately heard by observers at Santiago University, Chile. Eduardo Diaz, CE3GA, and colleagues relayed the good news to the world via an open network line, part of the AMSAT Launch Information Network Service, ALINS. Listeners across the globe heard the initial CW telemetry as relayed by CE3GA on 15 meters to Tom Clark, W3IWI in Maryland and thence through the ALINS. Junior DeCastro, PY2BJO, also reported hearing from JO-12 at the moment of its birth. Later he described it in terms reminiscent of the initial cries of a new-born child.

Twenty minutes later Amateurs in Europe got their first look at JO-12. Surprisingly, the transponder was found to be on. Dozens of QSOs immediately ensued. Only later was it learned that JARL wished that operations not begin until certain formalities with the Japanese ministry of telecommunications were complete. It was later revealed that transponder operation was inseparable from the Mode JA beacon (as with some prior OSCARs) so that it was necessary to have the transponder on in order to receive the all-important initial telemetry.

Initial telemetry reports were mostly favorable with a minor concern over some temperature values. This concern soon dissipated, however, when the telemetry values were re-calibrated by JAMSAT engineer Miki Nakayama, JR1SWB, and his colleague Mori, JK1VXJ. The complete CW telemetry suite description and format appears in *Amateur Satellite Report* #130. The updates calculated by JR1SWB and JK1VXJ will appear elsewhere in this edition.

Transponder performance was reported as excellent. The receiver was superbly sensitive. Harold Price, NK6K, reported satisfactory results with 1 watt to his KLM uplink antenna. He suggested JO-12 could probably be worked with an "omni" if one cared to use a bit more rf at the antenna. WA2LQQ similarly found CW signals 23 dB out of the noise on the downlink resulted from a modest 15 watts ERP uplink on a vacant transponder at approximately 2500 km range.

Some observers reported minor inter-modulation distortion effects and "spurs" at 49 kHz above the beacon. JR1SWB explained that due to an extremely tight power budget, the base current could not be as high as desired so the IMD products were a bit higher than desired. They were thought to be well below objectionable levels Miki said.

Most transponder users reported very deep fades on the downlink. This is due to the random spinning of the satellite in its early life. According to JAMSAT President Harry Yoneda, JA1ANG, the tumbling will dampen out in a few weeks due to the passive stabilization built into JO-12. Like previous OSCARs, JO-12 has a passive stabilization system consisting of a simple bar magnet. The interaction of this magnet's field with the geomagnetic field produces a small but persistent torque. Over time this torque will reduce the tumbling motion of the spacecraft and tend to keep the satellite in constant alignment with the geo-magnetic field. The transponder user will notice this over the coming weeks with a gradual reduction in the tumble rate. In the long term the tumble rate will phase-lock with the orbital period and users will observe a regular relation between polarization and strength of the downlink and relative position of the satellite.

The projected life of JO-12 is 3 years or more. It weighs 50 kilograms on earth and is 400 mm in diameter and 470 mm in height. Its solar cells generate 8 watts at start of life.

Tracking Mystery Looms

Initial tracking of JO-12 immediately after deployment was accomplished simply and accurately by adjusting the prelaunch estimates to account for the 14 minute delay of the launch from 2031 to 2045 UTC on August 12. Using these adjusted prelaunch estimates, Amateurs easily tracked JO-12.

Curiously, however, when NASA's first element set for JO-12 became available and was loaded into the tracking programs, the resulting predictions were a first magnitude "Boo!"; they just didn't work. The adjusted pre-launch values continued to be the best available numbers until August 15. It was then concluded that an old confusion factor had again overtaken the launch of an OSCAR.

Beginning on Thursday, August 14, it began to appear that NASA had mis-labeled the satellites launched by the Japanese H1 vehicle. NASA was calling object 16908 the Experimental Geodetic Payload (EGP), 16909 JAS-1 and 16910 the rocket body. But there was accumulating evidence that 16908 might be JAS-1! This evidence included numerous observations by dozens of experienced satellite trackers including NK6K, WØRPK, WA3WBU and W2RS and KA9Q.

Several had made precise Doppler measurements noting the Time of Closest Approach (TCA) as described in the Satellite Experimenter's Handbook by K2UBC. Based on this data, W2RS for example, had estimated the actual mean motion of JO-12 to be "about 12.44". Thus, even while NASA was saying JO-12 had a mean motion of 12.32, the observational evidence pointed to a higher value.

By Friday, August 15, element set #3 for object 16908 was released by NASA. It revised the mean motion from 12.42597 on element set 1 to 12.44365 converging nicely on W2RS's estimate. This further deepened suspicions that 16908 was JO-12 rather than 16909 as first indicated.

But how could this happen? Was this unprecedented? In 1978 AMSAT OSCAR 8 was confused with another object launched with it. AMSAT helped the authorities distinguish AO-8. In 1981, AMSAT helped sort out the several of the RS birds that were launched in a flock of 6 (RS-3 thru 8).

A possible answer to the puzzle of which object was really JO-12 came Friday, August 15. It came in two parts. First, a NASA employee at the Goddard Space Flight Center explained how the satellites get labeled. He said that normally North American Air Defense (NORAD) authorities label the new spacecraft in the order in which they are observed. Thus, 16908 would have been the first observed by NORAD's radar. NORAD knew from NASDA, the Japanese launch authority, the first object to be deployed was EGP. So NORAD expected the first object spotted would be EGP. So EGP became the name of the first object NORAD actually observed in the group. Was it really EGP?

A second revelation came when Miki, JR1SWB, pointed out that JAS-1 was deployed downward or backwards. This meant it would have had a slightly lower altitude and thus a slightly higher mean motion than EGP and the rocket's second stage. Since JAS-1 had a higher mean motion, it had a higher angular velocity. Had it shown up first on NORAD radar even though it was deployed after EGP?

It seemed so for on August 15, when NASA's element set #3 for object 16908 was assumed to be JO-12, it was soon found that it fit almost exactly with precise radio observations of JO-12. AOS/LOS times were within 10 seconds of predicted and the mean motion of the set fit W2RS's predictions to a satisfying degree. WØRPK's TCA measurements showed an excellent fit as well.

Then on Saturday evening, August 16, Tom, W3IWI reported that the EGP experimenters were getting excellent laser ranging from EGP and had fixed its time and position precisely. The next part was a bombshell for the earlier hypothesis that JO-12 was actually 16908. Tom reported the EGP people had virtually a perfect fit between the NASA-supplied elements for 16908 and the actual, super-precise EGP laser ranging determinations! Did this mean that 16908 was really EGP and not JO-12 after all?

But how could the excellent fit with the radio observations be accounted for? Objects 16909 and 16910 were thousands of miles away so neither of them could possibly be JO-12. The dilemma was essentially this. Everyone knew precisely where 16908 was but the EGP people had good data to show 16908 was EGP and AMSAT had excellent data to show 16908 was JO-12. How could this be?

Both KA9Q and WA2LQQ concluded the most reasonable explanation that fit the observations was that 16908 was after all EGP, but that neither 16909 nor 16910 was JO-12. Furthermore, JO-12 HAD to be in the vicinity of EGP but had not yet been detected or cataloged by NORAD or NASA.

To test this hypothesis, KA9Q ran another precise Doppler curve to detect TCA. He calculated JO-12 was leading 16908 as described by NASA element set #3 and W3IWI's estimate of EGP's position by 5 seconds at 08:37 UTC on 17 August. In W3IWI's EGP report he mentioned the EGP experimenters had visually observed EGP quite easily. Significantly, they noted a small object leading EGP by about 3 seconds. Could it have been JO-12? Data now suggests so.

At present all available data points to the following. Object 16908 is in fact EGP to a high degree of certainty. Objects 16909 and 16910 are the launcher second stage and probably some debris from it. Certainly neither is JO-12. JO-12 is probably uncataloged at present. It is likely leading EGP by perhaps 5 seconds or about 20 miles and diverging slowly from it.

Stay tuned for the next episode in the great detective mystery, "Satellite, satellite, where is our satellite?"

Spectacular Visual Observations Reported

Amateurs have reported spectacular visual observations associated with the launch of Japan's H1 vehicle on August 12. At least one observer, VE3DSO in London, Ontario, reports having seen all three major objects launched, the EGP (Experimental Geodetic Payload), JO-12 and the rocket body.

The rocket body was reported to have been enveloped in a bluish, iridescent cloud of gas. Similar reports made news headlines across North America. The gas was apparently ionized hydrogen released by the intentional venting of the launcher's tanks and the subsequent effect of solar

radiation. The solar radiation ionized the hydrogen much as it does atmospheric hydrogen. The H1 final stage was an advanced cryogenic stage using liquid hydrogen (LH) and liquid oxygen (LOX). By agreement between nations, launchers will be vented as soon as practical in such a way as to cause the launcher to de-orbit earlier than it otherwise would. Space junk accumulation is becoming a growing source of concern among space-venturing nations.

VE3DSO says he actually saw JO-12 with binoculars. It appeared bluish with a slight twinkle. Sources indicate the blue color results from the solar cells and their coatings. JO-12's entire "26-adron", polyhedral surface is covered with solar cells.

EGP is much more easily visible. Covered with dozens of laser retro-reflectors and plane mirrors, it is specifically designed to be ranged by laser and visually spotted. Its primary objective is to provide precise information on the position and movements of various observation sites on the earth. About 7 feet in diameter, the EGP can be as bright as a 1st magnitude star when observed under optimum lighting conditions. According to W3IWI, its brightness can vary from 1 to 4 while most of the time being around 2, the apparent magnitide of Polaris, the North Star.

EGP should be visible between 15 minutes after sunset and through perhaps local midnight according to KA9Q. Similarly, it should be visible from up to four hours before dawn through about 15 minutes before dawn. According to VE3DSO, there was a prominent twinkle to EGP when he saw it due, he says, to the effects of the many mirrors on the large sphere. EGP was the primary payload on the H1 launch.

ALINS Is Most Successful Yet

The AMSAT Launch Information Network Service (ALINS) organized for the JO-12 launch was by all accounts the best ever provided for an OSCAR launch. ALINS consisted of pre-launch nets and post-launch nets as well as real-time coverage on launch day. Several thousand listeners are estimated to have witnessed the launch as it happened via this exclusive AMSAT launch information system. The highlight of the month-long ALINS operation was the launch day coverage.

A hybrid network of radio and telephone links established a network spanning the entire globe. Few if any areas were left without a live network feed providing information on the progress of the launch as it happened. A telephone network was established between key centers and rf transmission ports. The primary information sources turned out to be JA1ANG, CE3GA, G3YJO and WØRPK. JA1ANG in Tokyo provided countdown coverage as H1 was launched and recounted progress of the launch. CE3GA in Santiago provided live coverage of the first JO-12 telemetry signals as relayed through W3IWI. G3YJO provided similar telemetry coverage when JO-12 appeared over London. WØRPK provided continuity and background information as network control from Iowa.

Transmitting the live telephone ALINS audio on the hf bands were WA3NAN at the Goddard Space Flight Center on 14.295 MHz covering the U.S and Canada, WA2LQQ in New York on 14.282 covering Europe, W6SP in Los Angeles on 14.282 covering South Pacific, WØRPK in Iowa on 7185 covering the mid-west, W6GC in Los Angeles on 7185 covering the west coast and ZS6AKV covering Southern Africa on numerous frequencies.

The JO-12 ALINS was planned and organized by Ralph Wallio, WØRPK, AMSAT's Vice President of Operations in cooperation with JAMSAT President Harry Yoneda, JA1ANG.

Revised JO-12 CW Telemetry Equations

The JO-12 CW telemetry equations published in *ASR* #130 have been updated very recently by JK1VXJ and JR1SWB. The revised equations are presented here. The following are for telemtery cells (channels) 1A through 3D. To determine the values transmitted, follow the instructions in *ASR* #130 except do not divide by 50 as previously instructed to find "N". In the new equations, simply strip off the row identifier (first digit) and insert the remaining two-digit number as "N" in the equations supplied here. For example, suppose cell 2B read 283. Strip the 2 leaving 83. Plug into the new equation to get 5.22 volts on the 5 volt regulated bus. Thanks to W3IWI for additional telemetry details on the PSK telemetry and store and forward functions which will be provided in future issues.

Revised JO-12 Telemetry Equations
(Per JK1VXJ and JR1SWB)

#1A	Total Solar Panel Current	20 * (N + 4) mA
#1B	Battery Charge/Discharge	40 * (N - 46) mA
#1C	Battery Voltage	(N + 4) * 0.22 v
#1D	Half-Battery Voltage	(N + 4) * 0.098 v
#2A	Bus Voltage	(N + 4) * 0.20 v
#2B	+ 5 V. Reg. Voltage	(N + 4) * 0.060 v
#2C	JTA Power Output	2.0 * (N + 4)**1.618 mW
#2D	Calibration Voltage #1	(N + 4) / 50 v
#3A	Battery Temp.	1.5 * (62 - N) deg. C
#3B	Baseplate Temp. #1	1.5 * (62 - N) deg. C
#3C	Baseplate Temp. #2	1.5 * (62 - N) deg. C
#3D	Baseplate Temp. #3	1.5 * (62 - N) deg. C

Short Bursts

• AO-10 was briefly restored to operation early on August 14 UTC but apparently the IHU crashed again by later in the day. According to AO-10 controllers, a further rewrite of the IPS-C4 operating system could be required. An attempt to reload the IHU will probably be made on August 18.

• Users of the new MAPTRAK program for the C-64 take note. The instructions on its use need to be clarified. When entering the date, you need to put a space between the month, day and year. For example, entering 070886 will cause an error. Enter instead 09 12 86 for September 12, 1986. That should clear up the problems. The instruction manual will be updated to clarify this point.

• Arianespace has told AMSAT that the problems which caused the recent loss of the V-18 mission 30 May will delay the next launch, V-19 until first quarter 1987. AMSAT's Phase 3C manifested aboard V-21 is thus possible for launch next summer or early autumn. A new radiation hardened-memory for Phase 3C is now being developed based on a committment from Harris Custom Integrated Ciruit Divi-

sion, Melbourne, Florida, to supply flight modules of their type HS6564RH 64k memories to AMSAT. More on this in future reports.

New Technical Publication To Debut In October

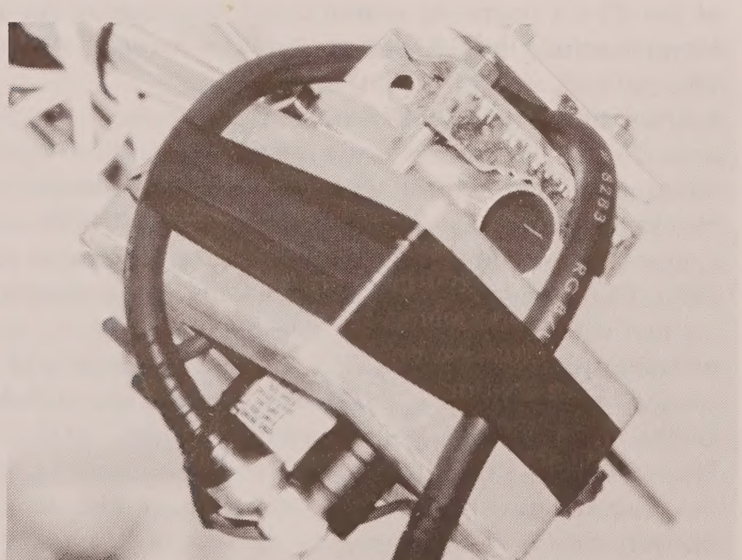
AMSAT and ARRL have consummated an agreement whereby they will jointly publish an advanced technical magazine. The new magazine will be an outgrowth of the popular "QEX" technical magazine ARRL has published for several years. The magazine will continue under the name QEX but with the new subtitle, "The ARRL Experimenters' Exchange and AMSAT Satellite Journal".

AMSAT has appointed Dr. Ron Long, W8GUS, of Columbus, Ohio to be its Associate Editor on the staff of QEX. Ron will report to QEX Editor Paul Rinaldo and act as AMSAT's technical editor for material appearing in QEX. Ron, an AMSAT member of long standing, is full Professor of Electrical Engineering at Ohio State University, Columbus, and a member of Phi Beta Kappa, the honorary fraternity.

QEX/SAT, will feature first-rate technical articles from experts in several fields. The current edition (August) contains articles by Fujio Yamashita, JS1UKR, on a PSK demodulator for JAS-1 and another by Jim Eagleson, WB6JNN, President of Project OSCAR, on Community Access Stations. Succeeding editions will feature an increasing proportion of satellite-oriented materials. Jeff Ward, G0/K8KA, studying under G3YJO at Surrey, may soon join QEX/SAT as a regular columnist reporting on University of Surrey satellite activities. In addition, QEX/SAT will offer articles on advanced technical topics such as ACSSB, packet radio and networking, spread spectrum, meteor scatter and more.

As part of the joint publication agreement, AMSAT members will enjoy a substantial discount over the QEX/SAT cover price. QEX will soon be available on ARRL bookstore shelves at $1.75 per copy. But if AMSAT members subscribe through AMSAT Headquarters soon, they can obtain subscriptions for only $6.00 annually or 50 cents per copy, delivered.

QEX/SAT will also be available mailed overseas by Air Mail for $21 per year for AMSAT members. These rates cannot be guaranteed indefinitely. Call or write AMSAT Headquarters for details: 301-589-6062 or write AMSAT, P.O. Box 27, Washington, D.C. 20044.



New Commodore 128 Tracking Software Now Available

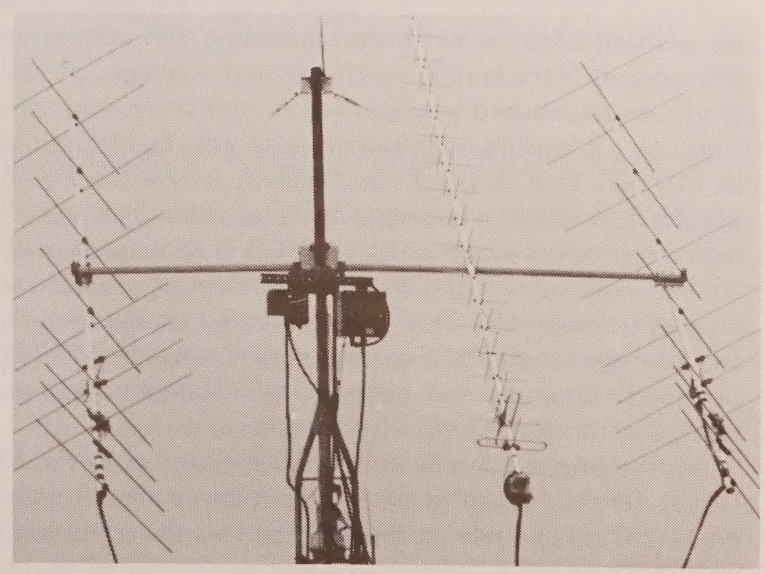
Paul Roemer, KG6LC, New Hampshire Area Coordinator says the new "ORBITS" tracking program for the Commodore C-128 personal computer is now available. This program features greatly improved speed compared to currently available Commodore tracking programs and is capable of tracking as many as twenty satellites. In addition to the Commodore C-128 computer, the user should have a disk drive, 80-column monitor, and a Commodore-compatible printer.

"ORBITS" was translated for the C-128 by AMSAT member Paul MacDonald, WA1OMM, of Nashua, New Hampshire, from the original version by W3IWI. "ORBITS" is available on disk through the AMSAT Software Exchange at AMSAT Headquarters.

Tech Tip #1: Transmission Line Support For the KLM 40CX Yagi

The KLM 435-40CX is a very long 70 cm crossed yagi. Many have had excellent results with it on AO-10 Mode B uplink and Mode L downlink. In order to keep radiation from the transmission line from distorting a very good pattern and axial ratio (circularity), it is necessary to keep the feed line out of the field as much as possible. Feeding this long yagi from the rear (versus running the line down the boom to the center support) is thus desireable. But if the feed line droops unsupported from the connector on the relay box, it will place undue strain on the shield of the cable. With flexing caused by winds and antenna movement, the shield will soon fail leaving you wondering why Mode L sounds so weak.

Avoid this by adequately supporting the feed line. The photo shows one solution. Come out from the chasis mount "N" connector with a right-angle "N" cable connector. Then fabricate a small bar that will fit over the KLM-supplied box-to-boom clamp as shown. Pinch the cable between the boom clamp and your new bar but do not over-tighten. Dress the cable as shown. Secure with PVC tape. Leave a nice gentle loop for your cable and tape at a point on your tower beneath your azimuth rotor.



Orbit Predictions

Special Note:
New object included in this data is Japan OSCAR 12 (JO-12), catalog 16908(?), launched at 2047 hours, 12 August 86, UTC

Satellite	*OSCAR-9*
Catalog number	12888
Epoch time:	86217.47352440
Tue Aug 5 11:21:52.508 1986 UTC	
Element set:	921
Inclination:	97.6536 deg
RA of node:	220.7949 deg
Eccentricity:	0.0000966
Arg of perigee:	247.6603 deg
Mean anomaly:	112.4550 deg
Mean motion:	15.28584659 rev/day
Decay rate:	1.045e-05 rev/day²
Epoch rev:	26849
Semi major axis	6855.144 km
Anom period:	94.204792 min
Apogee:	495.632 km
Perigee:	494.308 km
Ref perigee:	3138.45308883
Tue Aug 5 10:52:26.874 1986 UTC	
Beacon:	145.8250 MHz

Satellite	*OSCAR-10*
Catalog number	14129
Epoch time:	86218.76440443
Wed Aug 6 18:20:44.542 1986 UTC	
Element set:	255
Inclination:	26.6203 deg
RA of node:	66.4538 deg
Eccentricity:	0.6026324
Arg of perigee:	133.1126 deg
Mean anomaly:	296.0283 deg
Mean motion:	2.05869731 rev/day
Decay rate:	2e-08 rev/day²
Epoch rev:	2368
Semi major axis	26104.320 km
Anom period:	699.471454 min
Apogee:	35459.772 km
Perigee:	3997.154 km
Ref perigee:	3139.85072075
Wed Aug 6 20:25:02.272 1986 UTC	
Translate freq	581.0047 MHz
Invert:	1
Beacon:	145.8090 MHz

Satellite	*OSCAR-11*
Catalog number	14781
Epoch time:	86220.74192413
Fri Aug 8 17:48:22.244 1986 UTC	
Element set:	160
Inclination:	98.1433 deg
RA of node:	286.9537 deg
Eccentricity:	0.0013911
Arg of perigee:	4.5100 deg
Mean anomaly:	355.6197 deg
Mean motion:	14.62062860 rev/day
Decay rate:	9e-08 rev/day²
Epoch rev:	13004
Semi major axis	7061.733 km
Anom period:	98.490977 min
Apogee:	693.541 km
Perigee:	673.894 km
Ref perigee:	3141.74275634
Fri Aug 8 17:49:34.148 1986 UTC	
Beacon:	145.8260 MHz

Satellite	*OSCAR-12*
Catalog number	16908(?)
Epoch time:	86226.76114828
Thu Aug 14 18:16:03.211 1986 UTC	
Element set:	3
Inclination:	50.0055 deg
RA of node:	247.2701 deg
Eccentricity:	0.0010919
Arg of perigee:	228.3492 deg
Mean anomaly:	131.6405 deg
Mean motion:	12.44365451 rev/day
Decay rate:	-3.9e-07 rev/day²
Epoch rev:	24
Semi major axis	7866.963 km
Anom period:	115.721631 min
Apogee:	1504.416 km
Perigee:	1487.236 km
Ref perigee:	3147.73176237
Thu Aug 14 17:33:44.269 1986 UTC	
Translate freq	581.8000 MHz
Invert:	1
Beacon:	435.7970 MHz

Satellite	*RS-5*
Catalog number	12999
Epoch time:	86220.03401586
Fri Aug 8 00:48:58.970 1986 UTC	
Element set:	342
Inclination:	82.9531 deg
RA of node:	78.4663 deg
Eccentricity:	0.0008817
Arg of perigee:	305.2137 deg
Mean anomaly:	54.8058 deg
Mean motion:	12.05054522 rev/day
Decay rate:	4e-08 rev/day²
Epoch rev:	20411
Semi major axis	8033.835 km
Anom period:	119.496668 min
Apogee:	1676.833 km
Perigee:	1662.666 km
Ref perigee:	3141.02138255
Fri Aug 8 00:30:47.451 1986 UTC	

Satellite	*RS-7*
Catalog number	13001
Epoch time:	86215.60470410
Sun Aug 3 14:30:46.434 1986 UTC	
Element set:	267
Inclination:	82.9575 deg
RA of node:	74.3157 deg
Eccentricity:	0.0021242
Arg of perigee:	224.3475 deg
Mean anomaly:	135.5885 deg
Mean motion:	12.08699811 rev/day
Decay rate:	4e-08 rev/day²
Epoch rev:	20419
Semi major axis	8017.664 km
Anom period:	119.136281 min
Apogee:	1666.842 km
Perigee:	1632.780 km
Ref perigee:	3136.57354378
Sun Aug 3 13:45:54.182 1986 UTC	

Satellite	*NOAA-9*
Catalog number	15427
Epoch time:	86215.24087059
Sun Aug 3 05:46:51.218 1986 UTC	
Element set:	107
Inclination:	99.0012 deg
RA of node:	174.0235 deg
Eccentricity:	0.0016549
Arg of perigee:	23.4725 deg
Mean anomaly:	336.7197 deg
Mean motion:	14.11440861 rev/day
Decay rate:	1.63e-06 rev/day²
Epoch rev:	8429
Semi major axis	7229.766 km
Anom period:	102.023403 min
Apogee:	866.895 km
Perigee:	842.966 km
Ref perigee:	3136.24545226
Sun Aug 3 05:53:27.74 1986 UTC	
Beacon:	137.5000 MHz

Satellite	*mir*
Catalog number	16609
Epoch time:	86223.83502892
Mon Aug 11 20:02:26.498 1986 UTC	
Element set:	258
Inclination:	51.6218 deg
RA of node:	308.9829 deg
Eccentricity:	0.0027242
Arg of perigee:	80.9868 deg
Mean anomaly:	279.3891 deg
Mean motion:	15.74748576 rev/day
Decay rate:	7.928e-05 rev/day²
Epoch rev:	2729
Semi major axis	6724.000 km
Anom period:	91.443169 min
Apogee:	376.992 km
Perigee:	340.357 km
Ref perigee:	3144.84924828
Mon Aug 11 20:22:55.51 1986 UTC	
Beacon:	143.6250 MHz

Satellite	*Salyut-7*
Catalog number	13138
Epoch time:	86223.83306343
Mon Aug 11 19:59:36.680 1986 UTC	
Element set:	280
Inclination:	51.6258 deg
RA of node:	307.5001 deg
Eccentricity:	0.0002804
Arg of perigee:	153.0970 deg
Mean anomaly:	206.9948 deg
Mean motion:	15.79362309 rev/day
Decay rate:	5.559e-05 rev/day²
Epoch rev:	24855
Semi major axis	6710.900 km
Anom period:	91.176039 min
Apogee:	337.328 km
Perigee:	333.564 km
Ref perigee:	3144.85997394
Mon Aug 11 20:38:21.748 1986 UTC	

AO-10 Apogees: The first apogee of each UTC day with SSP.

Day	*Date*	*Time*	*Latitude*	*Longitude*	*Arg.Per.*
Sun	17Aug	07:03:40	18.2s	47.4w	135.9
Mon	18Aug	06:22:37	18.1s	38.0w	136.2
Tue	19Aug	05:41:33	18.0s	28.6w	136.4
Wed	20Aug	05:00:29	17.9s	19.2w	136.7
Thu	21Aug	04:19:25	17.8s	9.8w	136.9
Fri	22Aug	03:38:22	17.7s	0.4w	137.2
Sat	23Aug	02:57:18	17.6s	350.9w	137.4

Wednesday August 20, 1986

OSCAR-9
Wed Aug 20 00:08:31.170 1986 UTC:
Ascending node at 94.4 west
Nodal period: 94.26322 min
Longitude increment:
23.562971 deg w/orbit
Element set 921, epoch:
Tue Aug 5 11:21:52.508 1986 UTC

OSCAR-11
Wed Aug 20 00:49:02.33 1986 UTC:
Ascending node at 42.2 west
Nodal period: 98.54948 min
Longitude increment:
24.637315 deg w/orbit
Element set 160, epoch:
Fri Aug 8 17:48:22.244 1986 UTC

OSCAR-12
Wed Aug 20 01:29:20.132 1986 UTC:
Ascending node at 119.5 west
Nodal period: 115.65582 min
Longitude increment:
29.240022 deg w/orbit
Element set 3, epoch:
Thu Aug 14 18:16:03.211 1986 UTC

RS-5
Wed Aug 20 01:44:11.445 1986 UTC:
Ascending node at 282.2 west
Nodal period: 119.55317 min
Longitude increment:
30.015306 deg w/orbit
Element set 342, epoch:
Fri Aug 8 00:48:58.970 1986 UTC

RS-7
Wed Aug 20 01:50:11.725 1986 UTC:
Ascending node at 290.4 west
Nodal period: 119.19309 min
Longitude increment:
29.925196 deg w/orbit
Element set 267, epoch:
Sun Aug 3 14:30:46.434 1986 UTC

mir
Wed Aug 20 00:30:08.338 1986 UTC:
Ascending node at 68.7 west
Nodal period: 91.37350 min
Longitude increment:
23.232326 deg w/orbit
Element set 258, epoch:
Mon Aug 11 20:02:26.498 1986 UTC

Salyut-7
Wed Aug 20 01:24:06.47 1986 UTC:
Ascending node at 84.2 west
Nodal period: 91.10872 min
Longitude increment:
23.167201 deg w/orbit
Element set 280, epoch:
Mon Aug 11 19:59:36.680 1986 UTC

U.S. To Build Shuttle Replacement But Scrub Most Commercial Payloads

The White House has announced that President Reagan has decided to go ahead with construction of a replacement Shuttle for the Challenger which was destroyed in the world's worst space disaster January 28th. Construction will take about 4 years and costs will probably exceed $2 billion.

In a major policy shift, the White House simultaneously announced that future Shuttle missions will be for national security or scientific payloads. Excluded will be most commercial satellite launches. These will be obliged to find commercial launches spokesman said. Hughes Aerospace is among those proposing to develop a new commercial launcher to compete with Ariane, the Japanese H1, the Chinese Long March series and recently the Russian commercial launch offerings.

Meanwhile, the Air Force has gained approval for and selected initial contractors for a new medium launch vehicle, MLV. This unmanned expendable rocket will be developed to launch the important Global Positioning Satellite (GPS) or NAVSTAR system. The GPS program operational schedule has been severely impacted by the launcher disasters of recent months.

AMSAT has a continued interest in Shuttle launches. Long range goals include a Get Away Special (GAS can) launch for PACSAT and perhaps eventually a Phase 4 launch if suitable booster stages can be devised.

Information on the EGP "Mirrorball"

By Tom Clark, W3IWI

The Japanese Experimental Geodetic Payload (EGP) (the "Mirrorball") was designed by the Hydrographic Department of Japan (JHD) and launched along with JAS-1. This is a ball approximately 2m in diameter covered with various reflective materials. Its intended purpose is to provide a target for precise determination of geodetic station locations both by actively bouncing laser signals off it to determine its range and by passive photography to determine its position against the background star field.

The NASA Crustal Dynamics Project (CDP) operates a number of satellite laser ranging stations around the world and provides network services to a number of other cooperating institutions through the Goddard Laser Tracking Network (GLTN). Early reports from the world-wide laser tracking network are that excellent signals are being obtained from EGP. The two initial stations to acquire EGP data were the Royal Greenwich Observatory at Herstmonceux and NASA's MOBLAS-7 at Goddard. Very strong signals were obtained on multiple satellite passes on the night of the launch from MOBLAS-8 at Quincy, California. NASA's MOBLAS-5 station at Yarragadee, Australia also reported good tracking of EGP on the first few orbits.

Since then good data has continued to pour in to GLTN and the data analysts are having a field day!

The Radio Amateur Satellite Corporation
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ASR Seeks Tech Tipsters; More

ASR is looking for clever technical solutions to common problems we run into in satellite operation. In the tradition of *QST's* Hints n Kinks, *ASR* will be running a series of Tech Tips. The first appears in this issue. If you have a favorite, you might get it published here and get a special Tech Tipster Certificate for your shack. Just send in your tip with a photo or sketch as required to: *ASR*, Tech Tips, P.O. Box 177, Warwick, NY 10990.

ASR will also be re-starting a Spotlight column featuring outstanding AMSAT members and their achievements. *ASR* had this popular feature for its first few years and will now revive it. If you know of someone who is particularly deserving of being the focus of the *ASR* Spotlight, let us know at the same address as above.

The popular Mini-Tutorials will also return. Have a topic you would like see covered by an expert in the field in capsule form? Drop us a line.

And if you have some thoughts you'd like your editor to ponder, drop him a note too. The more interesting letters will be published.

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Amateur Satellite Report (ISSN 0889-6089) is published biweekly for $16 (inseparable from annual membership dues of $24) by AMSAT, Post Office Box 27, Washington, DC 20044. Second class postage paid at Silver Spring, MD and additional mailing offices. POSTMASTER: send address changes to *Amateur Satellite Report*, Post Office Box 27, Washington, DC 20044.